IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant:	Wei
Serial No.:	10/736,922
Filed:	December 16, 2003
Group Art Unit:	1753
Examiner:	Mayekar, Kishor
Title:	BIFUNCTIONAL LAYERED PHOTOCATALYST/THERMOCATALYST FOR IMPROVING INDOOR AIR QUALITY

Mail Stop Appeal Brief- Patents
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

APPEAL BRIEF

Dear Sir:

Subsequent to the filing of the Notice of Appeal on July 14, 2006, Appellant hereby submits its brief. The Commissioner is authorized to charge Deposit Account No. 03-0835 in the name of Carrier Corporation $500.00 for the appeal brief fee. Any additional fees or credits may be charged or applied to Deposit Account No. 50-1482 in the name of Carlson, Gaskey & Olds, P.C.

REAL PARTY IN INTEREST

The real party in interest is Carrier Corporation, the assignee of the entire right and interest in this Application.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

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STATUS OF CLAIMS

Claims 1-44 are pending in this application. Claims 34, 41 and 42 stand finally rejected under 112, first paragraph and 112, second paragraph. Claims 1-44 stand finally rejected under 103(a).

STATUS OF AMENDMENTS

All amendments have been entered.

SUMMARY OF CLAIMED SUBJECT MATTER

As shown in Figure 1, this invention relates to a purification system 10 including a substrate 28 and a layered catalytic coating 40 (page 5, line 21 to page 6, line 2). The coating 40 includes a first layer 44 of one of metal/titanium dioxide and metal compound/titanium dioxide applied on the substrate 40 and a second layer 46 of one of titanium dioxide and metal compound/titanium dioxide applied on the first layer 44 (page 5, lines 21 to 26). This basic structure is set forth in Independent Claim 1.

Dependent claim 13 depends on claim 1 and adds that the second layer 46 is metal compound/titanium dioxide including metal oxide on titanium dioxide, and the metal oxide is at least one of WO_3, ZnO, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O_4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2 (page 7, lines 12 to 16). Dependent claim 14 depends on claim 1 and adds that the second layer 46 is porous (page 13, lines 15 to 17). Dependent claim 15 depends on claim 1 and adds that the second layer 46 is partially transparent to ultraviolet light (Claim 15). Dependent claim 17 depends on claim 1 and adds that the first layer 44 is metal compound/titanium dioxide including metal compound on titanium dioxide, and the metal compound is metal oxide (page 6, lines 25 to 26). Dependent claim 19 depends on claim 1 and adds that the first layer 44 is on a portion of a surface of the substrate 42, and the second layer 46 is on a different portion of the surface of the substrate 42 (page 13, line 26 to page 14, line 2).

Independent claim 20 recites a fluid purification system 62 including a container having an inlet 22 and an outlet 36, a porous substrate 42 inside the container, and a device 34 for drawing a fluid into the container through the inlet 22, flowing the fluid through the porous substrate 42, and expelling the fluid out of the container through the outlet 36 (page 5, line 21 to page 6, line 2). The fluid purification system 62 includes a layered catalytic coating 40 including a first layer 44 of one of metal/titanium dioxide and metal oxide/titanium dioxide applied on the substrate 42 and a second layer 46 of one of titanium dioxide and metal oxide/titanium dioxide applied on the first layer 44 (page 6, lines 21 to 26). An ultraviolet light source 32 activates the layered catalytic coating 40, and photons from the ultraviolet light source 32 are absorbed by the layered catalytic coating 40 to form a reactive hydroxyl radical. The reactive hydroxyl radical oxidizes contaminants in the fluid that are adsorbed onto the metal/titanium dioxide catalytic coating 40 when activated by the ultraviolet light source 32 to water and carbon dioxide in the presence of water and oxygen (page 6, lines 6 to 20).

Independent claim 21 recites a fluid purification system 62 including a first substrate 64 having a first coating 44 of one of metal/titanium dioxide and metal oxide/titanium dioxide and a second substrate 66 having a second coating 46 of one of titanium dioxide and metal compound/titanium dioxide (page 15, lines 11 to 26). Dependent claim 23 depends on claim 22 and adds that a metal oxide of the metal oxide doped titanium dioxide is at least one of WO_3, ZnO, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O_4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2 (page 15, lines 11 to 15).

Dependent claim 26 depends on claim 25 and adds that a metal oxide of the metal oxide doped titanium dioxide is at least one of WO_3, ZnO, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O_4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2 (page 15, lines 11 to 15). Dependent claim 29 depends on claim 28 and adds that the first substrate 70 is secured to the second substrate 72 (page 16, lines 9 to 11). Dependent claim 30 depends on claim 29 and adds that the first substrate 70 is secured to the second substrate 72 by one of an adhesive or an attachment member (page 16, lines 11 to 12). Dependent claim 31 depends on claim 28 and adds a third substrate 76 having a third coating of one of titanium dioxide, metal/titanium dioxide and metal compound/titanium dioxide and

a light source 32. The first substrate 70 and the second substrate 72 are located on a first side of the light source 32, and the third substrate 76 is located on an opposing second side of the light source 32 (page 16, lines 12 to 18). Dependent claim 32 depends on claim 21 and adds a third substrate 76 having a third coating of one of titanium dioxide, metal/titanium dioxide and metal compound/titanium dioxide and a light source 32. The first substrate 70 and the second substrate 72 are located on a first side of the light source 32, and the third substrate 76 is located on an opposing second side of the light source 32 (page 16, lines 12 to 18).

Independent claim 33 recites a method of purification including the steps of applying a layered catalytic coating 40 including a first layer 44 of one of metal/titanium coating and metal oxide/titanium dioxide on a substrate 42, applying a second layer 46 of one of titanium dioxide and metal oxide/titanium dioxide applied on the first layer 44, and activating the layered catalytic coating 40. The method further includes the steps of forming a reactive hydroxyl radical, adsorbing contaminants in an air flow onto the layered catalytic coating 40 and oxidizing the contaminants with the hydroxyl radical (page 5, line 21 to page 6, line 26).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Are Claims 34, 41 and 42 properly rejected under 35 U.S.C. 112, first paragraph?

B. Are Claims 34, 41 and 42 properly rejected under 35 U.S.C. 112, second paragraph?

C. Are Claims 1-28 and 31-44 properly rejected under 35 U.S.C. 103(a) based on Reisfeld et al. (US 2003//0021720) in view of Kobayashi (US 6,368,668) and/or Hemme et al. (US 6,627,173)?

D. Are Claims 29 and 30 properly rejected under 35 U.S.C. 103(a) based on Reisfeld et al. (US 2003//0021720) in view of Kobayashi (US 6,368,668) and/or Hemme et al. (US 6,627,173) and further in view of Hirano et al. (US 2003/0050196)?

ARGUMENTS

A. Rejection of claims 34, 41 and 42 under 35 USC 112, first paragraph.

The Examiner rejected claims 34, 41 and 42 under 35 USC 112, first paragraph, as failing to comply with the enablement requirement. The Examiner states that the specification fails to describe the variable x in Mn_xO_2, and the claimed invention is not enabling. Appellant respectfully disagrees.

The claimed invention is enabling. The variable x is the number of atoms of manganese in the compound Mn_xO_2, and one skilled in the art would understand this. X is a variable that generally is open as to its possibilities. X denotes any number of atoms of manganese that could bond with two oxygen atoms. Manganese and oxygen only bond together at specific ratios. Therefore, if a compound includes two oxygen atoms, the number x can represent any number of manganese atoms that are needed to form a compound of manganese oxide including two oxygen atoms. The Examiner states on page 4 of the Final Office Action that x can be more than one number, whether the number is an integer or a fraction. However, atoms only bond as numbers that are integers and not fractions. Therefore, because of the bonding of manganese and oxygen together, one skilled in the art would know what numbers the variable x can be. For example, x can be 1 to form MnO_2. However, this is only an example. The specification is enabling. Appellant respectfully requests that the rejection be withdrawn.

B. Rejection of claims 34, 41 and 42 under 35 USC 112, second paragraph.

The Examiner rejected claims 34, 41 and 42 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject which matter Appellant regards as the invention. Appellant respectfully disagrees.

The claimed invention is not indefinite. The variable x is the number of atoms of manganese in the compound Mn_xO_2, and one skilled in the art would understand this. X is a variable that generally is open as to its possibilities. X denotes any number of atoms of manganese that could bond with two oxygen atoms. Manganese and oxygen only bond together at specific ratios. Therefore, if a compound includes two oxygen atoms, the number x can represent any number of

manganese atoms that are needed to form a compound of manganese oxide including two oxygen atoms. The Examiner states on page 4 of the Final Office Action that x can be more than one number, whether the number is an integer or a fraction. However, atoms only bond as numbers that are integers and not fractions. Therefore, because of the bonding of manganese and oxygen together, one skilled in the art would know what numbers the variable x can be. For example, x can be 1 to form MnO_2. However, this is only an example. The specification is not indefinite. Appellant respectfully requests that the rejection be withdrawn.

C. Anticipation of Claims 1-28 and 31-44 based on based on Reisfeld et al. in view of Kobayashi and/or Hemme et al.

Claims 1-12, 16-18 and 34-36

Claims 1-12, 16-18 and 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reisfeld et al. in view of Kobayashi and/or Hemme et al. Reisfeld et al. teaches a coating of titanium dioxide. The Examiner admits that Reisfeld does not disclose a layered catalytic coating including a first layer of one of a metal/titanium dioxide and a metal compound/titanium dioxide applied on a substrate and a second layer of one of titanium dioxide and metal compound/titanium dioxide applied on the first layer. The Examiner states that Kobayashi discloses these features, and it would be obvious to employ these features in Reisfeld et al. The Examiner further states that the specification does not disclose the benefits of arranging each of the layers in the claimed order as compared to the generally and randomly applied layers as taught by Kobayashi, and therefore the claimed invention is obvious. Appellant respectfully disagrees.

The present invention is patentable and strikingly different from Reisfeld et al. in view of Kobayashi and/or Hemme et al. As described by the claims, the present invention provides an air purification system including:

a substrate; and

a layered catalytic coating including a first layer of one of metal/titanium dioxide and metal compound/titanium dioxide applied on said substrate and a second layer of one of titanium dioxide and metal compound/titanium dioxide applied on said first layer.

[See Claim 1]. Claims 1-44 of the present invention all share these same or similar features. [See Claims 1-44]

The claimed invention is not obvious. The Examiner admits that Reisfeld et al. does not disclose a layered catalytic coating including a layered catalytic coating including a first layer of one of a metal/titanium dioxide and a metal compound/titanium dioxide applied on a substrate and a second layer of one of titanium dioxide and metal compound/ titanium dioxide applied on the first layer. Kobayaski does not disclose a layered catalytic coating including a first layer of one of a metal/titanium dioxide and a metal compound/titanium dioxide applied on a substrate and a second layer of one of titanium dioxide and metal compound/ titanium dioxide applied on the first layer. Kobayaski only generally discloses a photocatalytic coating 2b of titanium dioxide or titanium dioxide including a metal or metal/oxide. Kobayaski generally discloses that "a plurality of different photocatalyst coating compositions may be provided followed by successive coating of the plurality of different photocatalyst coating compositions on the surface of the substrate." However, Kobayaski does not disclose any specific layers that form a coating 2b including the claimed layers, and there is no suggestion in Kobayaski to employ the claimed layers to form a coating.

The claimed layers in the claimed order provide benefits that would not be obtained by generally and randomly applying layers on a substrate as disclosed in Kobayaski. Appellant has invented a unique layered coating that provides benefits over the prior art and which allows the coating to be tailored for a specific application. That is, the choice and the selection of the particular

layers is inventive. Just randomly and generally applying layers to a substrate would not produce the effect of the claimed invention. There is no suggestion or teaching in Kobayaski to form the coating with the layers and order as claimed.

The Examiner also cited *In re Japikse* 86 USPQ 70, stating that "rearrangement of parts was held to have been obvious." In *In re Japikse*, claims to a hydraulic power press included features directed to a position of a starting switch. The Court held that there is "no invention in shifting the starting switch disclosed by Cannon to a different position since the operation of the device would not thereby be modified." That is, the Court held that moving the position of the starting switch was not a patentable features because moving the position of the starting switch would not have modified the operation of the device. As disclosed in the specification, each layer provides a different function. For example, titanium dioxide or metal oxide doped titanium dioxide are effective in oxidizing volatile organic compounds and semi-volatile organic compounds to carbon dioxide and water (paragraph 34). Titanium dioxide loaded with platinum is highly reactive with low polarity organic compounds (paragraph 48). Gold on titanium dioxide oxidizes carbon monoxide to carbon dioxide (paragraph 38). Manganese oxide/titanium dioxide decomposes ozone to oxygen simultaneously with oxidation of harmful volatile organic compounds to carbon dioxide, water and other substances (paragraph 53). Each of these different layers provide different functions. Therefore, if the layers in a coating were changed or randomly applied, the results produced by the coating would change. That is, the operation of the coating would be modified by changing or modifying the layers. *In re Japikse* relates to a case where operation of the device would not be modified by changing the position of the elements and is not relevant to the present claims. The claimed coating would function differently if the layers were applied in a different order. The claimed invention is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

The claimed invention is also not obvious by adding the features of Hemme et al. to Reisfeld et al. or the combination of Reisfeld et al. and Kobayaski. Hemme et al. discloses titanium dioxide doped with a metal compound. Hemme et al. does not disclose a layered catalytic coating.

Therefore, adding the features of Hemme et al. to Reisfeld or to the combination of Reisfeld et al. and Kobayaski does not disclose a catalytic coating including a first layer including metal/titanium dioxide or metal compound/titanium dioxide on a substrate and a second layer of titanium dioxide or metal compound/titanium dioxide on the first layer. There is no suggestion in Hemme et al. to use a layered coating. The combination does not disclose, suggest or teach the claimed invention. The claimed invention is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

Claim 13

The rejection of Claim 13 is separately contested from the rejection of Claims 1-44 et al. Claim 13 recites that the first layer is a metal compound loaded titanium dioxide coating, and the metal compound is at least one of WO_3, ZnO, CdS, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2. The Examiner admits that Reisfeld et al. does not disclose a layered catalytic coating including a first layer of one of a metal/titanium dioxide and a metal compound/titanium dioxide applied on a substrate and a second layer of one of titanium dioxide and metal compound/ titanium dioxide applied on the first layer. Therefore, Reisfeld et al. does not disclose a coating at least one of WO_3, ZnO, CdS, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2 loaded titanium dioxide. Kobayaski also does not disclose this feature. Kobayaski discloses a method for producing a photocatalytic material. A photocatalyst coating composition includes a photocatalytic metal oxide (column 3, lines 48 to 67) including TiO_2, ZnO, SnO_2, SnO_2, $SrTiO_2$, WO_3, Fe_2O_3 and V_2O_5. The photocatalyst coating composition can further including copper, silver, nickel, iron, zinc, platinum, gold, rhodium, vanadium, chromium, cobalt, manganese, tungsten, niobium, antimony, platinum group metals and oxides of the above metals, CUO_2, AG_2O_2, and molybdenum (column 5, lines 53 to 67). However, Kobayaski does not disclose, suggest or teach a layer including one of WO_3, ZnO, CdS, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2 *loaded titanium dioxide* as claimed. Hemme et al. also does not disclose this feature. Therefore, the

references taken together do not suggest, teach or disclose the claimed invention. The claimed invention is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

Claim 14

The rejection of Claim 14 is separately contested from the rejection of Claims 1-44 et al. Claim 14 recites that the second layer is porous. Neither Reisfeld et al., Kobayaski nor Hemme et al. disclose this feature. All these references disclose a coating, but none of the references disclose, suggest or teach a porous layer of a layered catalytic coating. Therefore, the references taken together do not disclose, suggest or teach the claimed invention. Claim 14 is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

Claim 15

The rejection of Claim 15 is separately contested from the rejection of Claims 1-44 et al. Claim 15 recites that the second layer is partially transparent to light. Neither Reisfeld et al., Kobayaski nor Hemme et al. disclose this feature. All these references disclose a coating, but none of the references disclose, suggest or teach a layer that is partially transparent to light. Therefore, the references taken together do not disclose, suggest or teach the claimed invention. Claim 15 is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

Claim 19

The rejection of Claim 19 is separately contested from the rejection of Claims 1-44 et al. Claim 19 recites that a first layer is on a portion of a surface of a substrate, and a second layer is on a different portion of the surface of the substrate. Neither Reisfeld et al, Kobayaski nor Hemme et al. disclose this feature. All these references disclose a coating, but none of the references disclose, suggest or teach a first layer on a portion of a surface of a substrate and a second layer on a different portion of the surface of the substrate. Reisfeld et al. and Hemme et al. only teach one type of layer. Kobayaski does not disclose different layers on different poitions of a substrate. Therefore, the

references taken together do not disclose, suggest or teach the claimed invention. Claim 19 is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

Claims 20, 37 and 38

The rejection of Claims 20, 37 and 38 is separately contested from the rejection of Claims 1-44 et al. The claimed invention is not obvious. The Examiner admits that Reisfeld et al. does not disclose a layered catalytic coating including a first layer of one of a metal/titanium dioxide and a metal compound/titanium dioxide applied on a substrate and a second layer of one of titanium dioxide and metal compound/ titanium dioxide applied on the first layer. Kobayaski also does not disclose a layered catalytic coating including a first layer of one of a metal/titanium dioxide and a metal compound/titanium dioxide applied on a substrate and a second layer of one of titanium dioxide and metal compound/ titanium dioxide applied on the first layer. Kobayaski only generally discloses a photocatalytic coating 2b of titanium dioxide or titanium dioxide including a metal or metal/oxide. Kobayaski generally discloses that "a plurality of different photocatalyst coating compositions may be provided followed by successive coating of the plurality of different photocatalyst coating compositions on the surface of the substrate." However, Kobayaski does not disclose any specific layers that form a coating 2b, including the claimed layers, and there is no suggestion in Kobayaski to employ the claimed layers to form a coating.

The claimed layers in the claimed order provide benefits that would not be obtained by generally and randomly applying layers on a substrate as disclosed in Kobayaski. Appellant has invented a unique layered coating that provides benefits over the prior art and which allows the coating to be tailored for a specific application. That is, the choice and the selection of the particular layers is inventive. Just randomly and generally applying layers to a substrate would not produce the effect of the claimed invention. There is no suggestion or teaching in Kobayaski to form the coating with the layers and order as claimed.

The Examiner also cited *In re Japikse* 86 USPQ 70, stating that "rearrangement of parts was held to have been obvious." In *In re Japikse*, claims to a hydraulic power press included features

directed to a position of a starting switch. The Court held that there is "no invention in shifting the starting switch disclosed by Cannon to a different position since the operation of the device would not thereby be modified." That is, the Court held that moving the position of the starting switch was not a patentable features because moving the position of the starting switch would not have modified the operation of the device. As disclosed in the specification, each layer provides a different function. For example, titanium dioxide or metal oxide doped titanium dioxide are effective in oxidizing volatile organic compounds and semi-volatile organic compounds to carbon dioxide and water (paragraph 34). Titanium dioxide loaded with platinum is highly reactive with low polarity organic compounds (paragraph 48). Gold on titanium dioxide oxidizes carbon monoxide to carbon dioxide (paragraph 38). Manganese oxide/titanium dioxide decomposes ozone to oxygen simultaneously with oxidation of harmful volatile organic compounds to carbon dioxide, water and other substances (paragraph 53). Each of these different layers provide different functions. Therefore, if the layers in a coating were changed or randomly applied, the results produced by the coating would change. That is, the operation of the coating would be modified by changing or modifying the layers. *In re Japikse* relates to a case where operation of the device would not be modified by changing the position of the elements and is not relevant to the present claims. The claimed coating would function differently if the layers were applied in a different order. The claimed invention is not obvious, and Appellant respectfully requests that the rejection be withdrawn and is not relevant to the present claims.

The claimed invention is not obvious by adding the features of Hemme et al. to Reisfeld et al. or the combination of Reisfeld et al. and Kobayaski. Hemme et al. discloses titanium dioxide doped with a metal compound. Hemme et al. does not disclose a layered catalytic coating. Therefore, adding the features of Hemme et al. to Reisfeld et al. or to the combination of Reisfeld et al. and Kobayaski does not disclose a catalytic coating including a first layer including metal/titanium dioxide or metal compound/titanium dioxide on a substrate and a second layer of titanium dioxide or metal compound/titanium dioxide on the first layer. There is no suggestion in Hemme et al. to use a layered coating. The combination does not disclose, suggest or teach the claimed invention. The

claimed invention is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

Claims 21, 22, 24, 25, 27, 28 and 39-42

The rejection of Claims 21, 22, 24, 25, 27, 28 and 39-42 is separately contested from the rejection of Claims 1-44 et al. There is no suggestion in any of the references to use two substrates each having a different coating as recited in Claims 21, 22, 24, 25, 27, 28 and 39-42. The Examiner states that Reisfeld et al. discloses more than one substrate and that one skilled in the art would provide each of Reisfeld et al.'s substrates with a different coating to increase the photocatalytic oxidation. However, the Examiner supplies no evidence of this assertion. Appellant cannot respond without the evidence, and thus ask that holding be dropped or evidence supplied. Notably, the relevant question is not whether different coatings on different substrates has ever been done anywhere. Instead, the question is whether it would have been obvious to employ the features in the claimed environment. Clearly, it would not have been. Reisfeld et al. only discloses a coating 120 on filter elements 12, 14 and 16. Only the coating 120 is disclosed. Different coatings 120 are not disclosed on each of the filter elements 12, 14 and 16. Additionally, Kobayaski only generally discloses coatings, but does not disclose, suggest or teach using a different coating on each of multiple substrates. Hemme et al. also does not disclose this feature. Therefore, the references taken together do not disclose, suggest or teach the claimed invention. The claimed invention is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

Claims 23 and 26

The rejection of Claims 23 and 26 is separately contested from the rejection of Claims 1-44 et al. Claims 23 and 26 recite that the first layer is a metal compound loaded titanium dioxide coating, and the metal compound is at least one of WO_3, ZnO, CdS, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2. The Examiner admits that Reisfeld et al. does not disclose a layered catalytic coating including a first layer of one of a metal/titanium

dioxide and a metal compound/titanium dioxide applied on a substrate and a second layer of one of titanium dioxide and metal compound/ titanium dioxide applied on the first layer. Therefore, Reisfeld et al. does not disclose a coating of at least one of WO_3, ZnO, CdS, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2 loaded titanium dioxide. Kobayaski also does not disclose this feature. Kobayaski discloses a method for producing a photocatalytic material. A photocatalyst coating composition includes a photocatalytic metal oxide (column 3, lines 48 to 67) including TiO_2, ZnO, SnO_2, SnO_2, $SrTiO_2$, WO_3, Fe_2O_3 and V_2O_5. The photocatalyst coating composition can further including copper, silver, nickel, iron, zinc, platinum, gold, rhodium, vanadium, chromium, cobalt, manganese, tungsten, niobium, antimony, platinum group metals and oxides of the above metals, CUO_2, AG_2O_2, and molybdenum (column 5, lines 53 to 67). However, Kobayaski does not disclose, suggest or teach a layer including one of WO_3, ZnO, CdS, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2 *loaded titanium dioxide* as claimed. Hemme et al. also does not disclose this feature. Therefore, the references taken together do not suggest, teach or disclose the claimed invention. The claimed invention is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

Claims 31 and 32

The rejection of claims 31 and 32 is separately contested from the rejection of Claims 1-44 et al. Claims 31 and 32 recite that a first substrate and a second substrate are located on a first side of a light source, and a third substrate is located on an opposing second side of the light source. First, there is no suggestion in any of the references to use two substrates each having a different coating as claimed. The Examiner states that Reisfeld et al. discloses more than one substrate and that one skilled in the art would provide each of Reisfeld et al.'s substrates with a different coating to increase the photocatalytic oxidation. However, the Examiner supplies no evidence of this assertion. Appellant cannot respond without the evidence, and thus ask that holding be dropped or evidence supplied. Notably, the relevant question is not whether different coatings on different substrates has

ever been done anywhere. Instead, the question is whether it would have been obvious to employ the features in the claimed environment. Clearly, it would not have been. Reisfeld et al. only discloses a coating 120 on filter elements 12, 14 and 16. Different coatings 120 are not disclosed on each of the filter elements 12, 14 and 16. Only the coating 120 is disclosed. Additionally, Kobayaski only generally discloses coatings, but does not disclose, suggest or teach using a different coating on each of multiple substrates. Hemme et al. also does not disclose this feature. None of the reference discloses, suggests or teaches using a different coating on each of different substrates. Therefore, the references taken together do not disclose, suggest or teach the claimed invention. Second, none of the references disclose, teach or suggest locating different coatings on opposite sides of a light source. Therefore, the references taken together do not teach, suggest or teach the claimed invention. The claimed invention is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

Claims 33, 43 and 44

The rejection of Claims 33, 43 and 44 are separately contested from the rejection of Claims 1-44 et al. Claims 33, 43 and 44 recite a method of purification including the steps of applying a layered catalytic coating on a substrate, wherein the layered catalytic coating includes a first layer of a photocatalytic coating, a second layer of a photocatalytic metal loaded metal compound coating, and a third layer of a thermocatalytic coating and activating the layered catalytic coating.

The claimed invention is not obvious. The Examiner admits that Reisfeld et al. does not disclose a layered catalytic coating including a first layer of one of a metal/titanium dioxide and a metal compound/titanium dioxide applied on a substrate and a second layer of one of titanium dioxide and metal compound/ titanium dioxide applied on the first layer. Kobayaski also does not disclose a layered catalytic coating including a layered catalytic coating including a first layer of one of a metal/titanium dioxide and a metal compound/titanium dioxide applied on a substrate and a second layer of one of titanium dioxide and metal compound/ titanium dioxide applied on the first layer. Kobayaski only generally discloses a photocatalytic coating 2b of titanium dioxide or

titanium dioxide including a metal or metal/oxide. Kobayaski generally discloses that "a plurality of different photocatalyst coating compositions may be provided followed by successive coating of the plurality of different photocatalyst coating compositions on the surface of the substrate." However, Kobayaski does not disclose any specific layers that form a coating 2b including the claimed layers, and there is no suggestion in Kobayaski to employ the claimed layers to form a coating.

The claimed layers in the claimed order provide benefits that would not be obtained by generally and randomly applying layers on a substrate as disclosed in Kobayaski. Appellant has invented a unique layered coating that provides benefits over the prior art and which allows the coating to be tailored for a specific application. That is, the choice and the selection of the particular layers is inventive. Just randomly and generally applying layers to a substrate would not produce the effect of the claimed invention. There is no suggestion or teaching in Kobayaski to form the coating with the layers and order as claimed.

The Examiner also cited *In re Japikse* 86 USPQ 70, stating that "rearrangement of parts was held to have been obvious." In *In re Japikse*, claims to a hydraulic power press included features directed to a position of a starting switch. The Court held that there is "no invention in shifting the starting switch disclosed by Cannon to a different position since the operation of the device would not thereby be modified." That is, the Court held that moving the position of the starting switch was not a patentable features because moving the position of the starting switch would not have modified the operation of the device. As disclosed in the specification, each layer provides a different function. For example, titanium dioxide or metal oxide doped titanium dioxide are effective in oxidizing volatile organic compounds and semi-volatile organic compounds to carbon dioxide and water (paragraph 34). Titanium dioxide loaded with platinum is highly reactive with low polarity organic compounds (paragraph 48). Gold on titanium dioxide oxidizes carbon monoxide to carbon dioxide (paragraph 38). Manganese oxide/titanium dioxide decomposes ozone to oxygen simultaneously with oxidation of harmful volatile organic compounds to carbon dioxide, water and other substances (paragraph 53). Each of these different layers provide different functions. Therefore, if the layers in a coating were changed or randomly applied, the results produced by the

coating would change. That is, the operation of the coating would be modified by changing or modifying the layers. *In re Japikse* relates to a case where operation of the device would not be modified by changing the position of the elements and is not relevant to the present claims. The claimed coating would function differently if the layers were applied in a different order. The claimed invention is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

The claimed invention is not obvious by adding the features of Hemme et al. to Reisfeld et al. or the combination of Reisfeld et al. and Kobayaski. Hemme et al. discloses titanium dioxide doped with a metal compound. Hemme et al. does not disclose a layered catalytic coating. Therefore, adding the features of Hemme et al. to Reisfeld or to the combination of Reisfeld et al. and Kobayaski does not disclose a catalytic coating including a first layer including metal/titanium dioxide or metal compound/titanium dioxide on a substrate and a second layer of titanium dioxide or metal compound/titanium dioxide on the first layer. There is no suggestion in Hemme et al. to use in a layered coating. The combination does not disclose, suggest or teach the claimed invention. The claimed invention is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

D. Obviousness of Claims 29 and 30 based on Reisfeld et al. in view of Kobayashi and and/or Hemme et al. and further in view of Hirano et al.

Claims 29 and 30

Claims 29 and 30 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Reisfeld in view of Kobayashi and/or Hemme and further in view of Hirano et al. The Examiner states it would be obvious to attach substrates because of Hirano et al. Claims 29 and 30 depend on patentable independent claim 21 and are allowable for the reasons set forth above. Claims 29 and 30 are not obvious because it is not obvious to provide a fluid purification system including a first substrate with a coating of one of metal/titanium dioxide and metal oxide/titanium dioxide and a second substrate with a coating of one of titanium dioxide and metal compound/titanium dioxide as

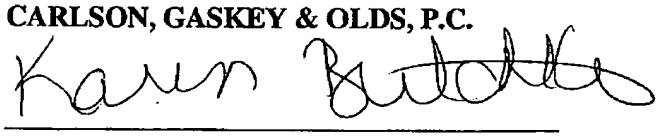
claimed. Claims 29 and 30 recite that a first substrate is attached to a second substrate. Hiarano discloses and illustrates substrates 14, 16 and 18 that are separate elements in a photocatalyitic purifier 10 and that are spaced and separated by UV lamps 20. Because of the presence of UV lamps 20 between the substrates 14, 16 and 18, the substrates 14, 16 and 18 cannot be secured together as claimed. That is, it is not possible to attach the substrates 14, 16 and 18 together. Therefore, when combined, the claimed invention is not taught, suggested or disclosed. The claimed invention is not obvious, and Appellant respectfully requests that the rejection be withdrawn.

CONCLUSION

For the reasons set forth above, the rejection of all claims is improper and should be reversed. Appellant respectfully requests such an action.

Respectfully Submitted,

CARLSON, GASKEY & OLDS, P.C.



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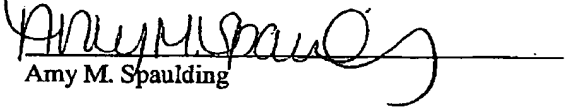
Dated: September 12, 2006

CERTIFICATE OF FACSIMILE

I hereby certify that this appeal brief is being facsimile transmitted to the United States Patent and Trademark Office, 571-273-8300 on September 12, 2006.



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CLAIM APPENDIX

1. A purification system comprising:

a substrate; and

a layered catalytic coating including a first layer of one of metal/titanium dioxide and metal compound/titanium dioxide applied on said substrate and a second layer of one of titanium dioxide and metal compound/titanium dioxide applied on said first layer.

2. The purification system as recited in claim 1 wherein said first layer is gold on titanium dioxide and catalytically oxidizes carbon monoxide to carbon dioxide and water.

3. The purification system as recited in claim 1 wherein said first layer is platinum/titanium dioxide and catalytically oxidizes low polarity organic compounds to carbon dioxide and water.

4. The purification system as recited in claim 3 wherein said first layer includes platinum on titanium dioxide, and said platinum has an increased affinity for said low polarity organic compounds, said low polarity organic compounds adsorb onto said platinum, and said hydroxyl radicals oxidize said low polarity organic compounds to carbon dioxide.

5. The purification system as recited in claim 1 wherein said first layer is manganese oxide/titanium dioxide and decomposes ozone.

6. The purification system as recited in claim 5 wherein said first layer includes manganese oxide on titanium dioxide, and said manganese oxide lowers an energy barrier of decomposition of said ozone to decompose said ozone to molecular oxygen.

7. The purification system as recited in claim 1 further including a light source to activate said layered catalytic coating, and said layered catalytic coating oxidizes contaminants in an air flow that are adsorbed onto said layered catalytic coating when activated by said light source.

8. The purification system as recited in claim 7 wherein said light source is an ultraviolet light source.

9. The purification system as recited in claim 7 wherein photons from said light source are absorbed by said layered catalytic coating, forming a reactive hydroxyl radical that oxidizes said contaminant in the presence of oxygen and water, and said reactive hydroxyl radical oxidizes said contaminants to water and carbon dioxide.

10. The purification system as recited in claim 7 wherein said contaminants are one of a volatile organic compound and a semi-volatile organic compound including at least one of formaldehyde, toluene, propanal, butene, acetaldehyde, aldehyde, ketone, alcohol, aromatic, alkene, and alkane.

11. The purification system as recited in claim 10 wherein said volatile organic compounds have boiling point less than 200°C.

12. The purification system as recited in claim 10 wherein said semi-volatile organic compounds have boiling point equal to or greater than 200°C.

13. The purification system as recited in claim 1 wherein said second layer is metal compound/titanium dioxide including metal oxide on titanium dioxide, and said metal oxide is at least one of WO_3, ZnO, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O_4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2.

14. The purification system as recited in claim 1 wherein said second layer is porous.

15. The purification system as recited in claim 1 wherein said second layer is partially transparent to ultraviolet light.

16. The purification system as recited in claim 1 wherein the purification system purifies air.

17. The purification system as recited in claim 1 wherein said first layer is said metal compound/titanium dioxide including metal compound on titanium dioxide and said metal compound is metal oxide.

18. The purification system as recited in claim 1 wherein said second layer is metal compound/titanium dioxide including metal compound on titanium dioxide, and said metal compound is metal oxide.

19. The purification system as recited in claim 1 further including a surface of said substrate, and wherein said first layer is on a portion of said surface of said substrate and said second layer is on a different portion of said surface of said substrate.

20. A fluid purification system comprising:

a container having an inlet and an outlet;

a porous substrate inside said container;

a device for drawing a fluid into said container through said inlet, flowing said fluid through said porous substrate, and expelling said fluid out of said container through said outlet;

a layered catalytic coating including a first layer of one of metal/titanium dioxide and metal oxide/titanium dioxide applied on said substrate and a second layer of one of titanium dioxide and metal oxide/titanium dioxide applied on said first layer; and

an ultraviolet light source to activate said layered catalytic coating, and photons from said ultraviolet light source are absorbed by said layered catalytic coating to form a reactive hydroxyl radical, and said reactive hydroxyl radical oxidizes contaminants in said fluid that are adsorbed onto said metal/titanium dioxide catalytic coating when activated by said ultraviolet light source to water and carbon dioxide in the presence of water and oxygen.

21. A fluid purification system comprising:

a first substrate having a first coating of one of metal/titanium dioxide and metal oxide/titanium dioxide; and

a second substrate having a second coating of one of titanium dioxide and metal compound/titanium dioxide.

22. The fluid purification system as recited in claim 21 wherein said first coating is gold/titanium dioxide and said second coating is metal oxide doped titanium dioxide.

23. The fluid purification system as recited in claim 22 wherein a metal oxide of said metal oxide doped titanium dioxide is at least one of WO_3, ZnO, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O_4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2

24. The fluid purification system as recited in claim 22 wherein said first substrate is proximate to an inlet of the air purification system and said second substrate is distal to said inlet of said air purification system.

25. The fluid purification system as recited in claim 21 wherein said first coating is manganese oxide/titanium dioxide and said second coating is metal oxide doped titanium dioxide.

26. The fluid purification system as recited in claim 25 wherein a metal oxide of said metal oxide doped titanium dioxide is at least one of WO_3, ZnO, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O_4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2

27. The fluid purification system as recited in claim 25 wherein said second substrate is proximate to an inlet of the air purification system and said first substrate is distal to said inlet of said air purification system.

28. The fluid purification system as recited in claim 21 wherein said first substrate is adjacent to said second substrate.

29. The fluid purification system as recited in claim 28 wherein said first substrate is secured to said second substrate.

30. The fluid purification system as recited in claim 29 wherein said first substrate is secured to said second substrate by one of an adhesive or an attachment member.

31. The fluid purification system as recited in claim 28 further including a third substrate having a third coating of one of titanium dioxide, metal/titanium dioxide and metal compound/titanium dioxide and a light source, first substrate and said second substrate are located on a first side of said light source and said third substrate is located on an opposing second side of said light source.

32. The fluid purification system as recited in claim 21 further including a third substrate having a third coating of one of titanium dioxide, metal/titanium dioxide and metal compound/titanium dioxide and a light source, wherein said first substrate and said second substrate are located on a first side of said light source and said third substrate is located on an opposing second side of said light source.

33. A method of purification comprising the steps of:

applying a layered catalytic coating including a first layer of one of metal/titanium coating and metal oxide/titanium dioxide on a substrate;

applying a second layer of one of titanium dioxide and metal oxide/titanium dioxide applied on said first layer;

activating said layered catalytic coating;

forming a reactive hydroxyl radical;

adsorbing contaminants in an air flow onto said layered catalytic coating; and oxidizing said contaminants with said hydroxyl radical.

34. The purification system as recited in claim 1 wherein said second layer is metal compound/titanium dioxide including metal oxide on titanium dioxide, and said metal oxide is Mn_xO_2.

35. The purification system as recited in claim 1 wherein said substrate is a honeycomb.

36. The purification system as recited in claim 1 wherein said first layer is a thermocatalyst.

37. The fluid purification system as recited in claim 20 wherein said porous substrate is a honeycomb.

38. The fluid purification system as recited in claim 20 wherein said first layer is a thermocatalyst.

39. The fluid purification system as recited in claim 21 wherein said first substrate and said second substrate are each a honeycomb.

40. The fluid purification system as recited in claim 21 wherein said first layer is a thermocatalyst.

41. The fluid purification system as recited in claim 22 wherein a metal oxide of said metal oxide doped titanium dioxide is Mn_xO_2.

42. The fluid purification system as recited in claim 25 wherein a metal oxide of said metal oxide doped titanium dioxide is Mn_xO_2.

43. The method as recited in claim 33 wherein said first layer is a thermocatalyst.

44. The method as recited in claim 33 wherein said substrate is a honeycomb.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None

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